

**U.S. FISH AND WILDLIFE SERVICE  
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Brickellia mosieri* (Small) Shinnery

COMMON NAME: Florida brickell-bush or Mosier's false boneset

LEAD REGION: 4

INFORMATION CURRENT AS OF: March 2010

STATUS/ACTION:

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): October 25, 1999

☐ Candidate removal: Former LP: ☐

☐ A - Taxon is more abundant or widespread than previously believed or not subject to

the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

- ☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ☐ F - Range is no longer a U.S. territory.
- ☐ I - Insufficient information exists on biological vulnerability and threats to support listing.
- ☐ M - Taxon mistakenly included in past notice of review.
- ☐ N - Taxon may not meet the Act's definition of "species."
- ☐ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants, Asteraceae (Compositae), Aster Family

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, U.S.A.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, Miami-Dade County, U.S.A.

LAND OWNERSHIP: Varied, see Table 1. There are 19 extant occurrences, approximately 8 on private land (2 conserved) and 11 on public land (owned by Miami-Dade County). The largest population is at Larry and Penny Thompson Park and adjacent public and private lands (includes University of Miami) (Bradley and Gann 1999, p. 15). Larry and Penny Thompson Park is 270 acres (109 hectares [ha]); however, this species is likely found on only a portion of the site.

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#### BIOLOGICAL INFORMATION:

Species Description: Florida brickell-bush is a perennial herb 1-3.5 feet (0.3-1.1 meters) tall, slender, erect, and branching (Chafin 2000, p. NA). Leaves are 0.4-1.2 inches (1-3 centimeters) long, alternate, narrow, linear, thick, usually spreading or curved downward, entire or slightly toothed, and resin-dotted (Chafin 2000, p. NA). The flower heads are in loose, open clusters at the ends of branches (Chafin 2000, p. NA). Disk flowers are white in small, dense heads surrounded by hairy, slightly ribbed bracts; there are no ray flowers, although long style branches (white, sometimes brown) may appear to be rays (Chafin 2000, p. NA). Reproduction is sexual, pollinators and dispersers are unknown (Bradley and Gann 1999, p. 12). Flowering takes place primarily in the fall (August-October), but individuals may be found in flower during most of the year (Bradley and Gann 1999, p. 12).

Taxonomy: Bradley and Gann (1999, p. 11) provided the following account. “*B. mosieri* was first described by Small in 1933 as *Kuhnia mosieri*. In 1970, Long reduced it to a varietal rank of *K. eupatorioides*, a plant more widespread in the eastern United States. Instead of using Small’s epithet, he created a completely new name for the variety, calling the species *K. eupatorioides* var. *floridana*. Shinnars (1971) retained it at the specific rank, but included all members of the genus *Kuhnia* in *Brickellia*, calling the species *B. mosieri*. In a 1989 study of the *B. eupatorioides* complex Turner recognized it as a variety of the more widespread *B. eupatorioides*, and gave it the new name *B. eupatorioides* var. *floridana*, using Long’s varietal epithet. Wunderlin (1998), thinking the plant to be specifically distinct from *B. eupatorioides*, has retained the use of *B. mosieri*” (Bradley and Gann 1999, p. 11).

The Integrated Taxonomic Information System (ITIS) (2010, p. 1) indicates that the taxonomic standing for *Brickellia mosieri* is not accepted. ITIS (2010, p. 1) uses *Brickellia eupatorioides* var. *floridana* (R. W. Long) B. L. Turner. NatureServe (2009, p. 1) also uses the name *B. eupatorioides* var. *floridana*. The online Atlas of Florida Vascular Plants (Wunderlin and Hansen 2008, p. 2) uses the name *B. mosieri*. The Florida Department of Agriculture and Consumer Services (FDACS) uses the name *B. mosieri* (Coile and Garland 2003, p. 7). The Institute for Regional Conservation (IRC) uses *B. mosieri*. Although there is not complete agreement on whether this taxon is a variety or a species, there is consensus that it is a distinct taxon. We have carefully reviewed the available taxonomic information to reach the conclusion that *B. mosieri* is a valid taxon.

Habitat: Bradley and Gann (1999, p. 11) stated that Florida brickell-bush is “found exclusively in pine rocklands. It tolerates only minor amounts of disturbance. The pine rockland habitat where it occurs in Miami-Dade County requires periodic fires to maintain an open sunny understory with a minimum amount of hardwoods. It tends to occur in areas within open shrub canopy and exposed limestone with minimal organic litter (pine needles, leaves, and other organic materials). Some populations are found at relatively high elevations for this area (ca. 3-4 meters), one occurrence is in a low elevation pine rockland very close to a marl prairie (2-3 meters). The pine rockland which contains this occurrence may have flooded periodically during the summer wet season. Periodic fires are extremely important in maintaining this ecosystem. The natural fire regime was probably 3-7 years, with most fires occurring at the beginning of the wet season in spring and early summer. These periodic fires keep the shrub canopy low and reduce litter accumulation.”

Historical Range/Distribution: Florida brickell-bush is “endemic to Miami-Dade County on the Miami Rock Ridge. It was historically distributed from central and southern Miami-Dade County from South Miami (latitude ca. 25° 42.5) to Florida City (latitude 25° 26.0). This is a range of approximately 22.5 miles along the Miami Rock Ridge. Herbarium specimens have not been studied from the New York Botanical Garden, so the full extent of its historic range is unknown.” (Bradley and Gann 1999, p. 11). Bradley and Gann (1999, p. 16) provided a list of herbarium specimens and other records for this plant that do not give precise or accurate location information. In these cases, the localities have almost certainly been destroyed because they were located in Miami-Dade County. Bradley and Gann (1999, p. 15) indicated that this species

was extirpated from two privately owned sites (Palms Woodlawn Cemetery, Sunset Drive and 71 Court) in 1968 and 1992, due to development.

**Current Range/Distribution:** The range of Florida brickell-bush has contracted at least 3 miles (4.8 kilometers) (Bradley and Gann 1999, p. 11), by more than 13 percent of its historic range. The species' current range is central and southern Miami-Dade County from SW 120 Street (latitude 25° 39.4) to Florida City (latitude 25° 26.0) (Bradley and Gann 1999, p. 11). Florida brickell-bush currently exists at the 19 sites listed in Table 1 (Bradley and Gann 1999, p. 15; data from IRC [K. Bradley, IRC, pers. comm. 2007, 2008]; element occurrence data from Florida Natural Areas Inventory [FNAI] [A. Jenkins, FNAI, pers. comm. 2007]). However, at least two occurrences on private land may be extirpated (\*=not seen in 2004, may still be present; \*\* = possibly extirpated), and one occurrence is extirpated (\*\*\*= extirpated, site destroyed) (K. Bradley, pers. comm. 2007). Data from IRC in 2007 provided several new occurrences, many of which are denoted as natural forest communities (NFC) and occur on private land (K. Bradley, pers. comm. 2007).

Table 1. Extant occurrences of Florida brickell-bush (Bradley and Gann 1999, p. 15; K. Bradley, pers. comm. 2007; J. Possley, pers. comm. 2008)

Site	Owner	Population Size	Threats
Camp Choe**	Private	11-100	fire suppression, exotic plants, development
Camp Owaissa Bauer	Miami-Dade County	11-100	fire suppression, exotic plants
Larry and Penny Thompson Park and adjacent properties (includes University of Miami)	Miami-Dade County, in part, University of Miami	1,000-1,500	exotic plants, development
Miami MetroZoo	Miami-Dade County	200-500	fire suppression
Navy Wells	Miami-Dade County	101-1,000	fire suppression, exotic plants
NFC #295	Private	101-1,000	development, fire suppression, exotic plants
Panther Pineland (P-338)*	Private	11-100	development, fire suppression, exotic plants
Pine Ridge Sanctuary	Private	Unknown	not assessed
Pine Shore Park	Miami-Dade County	50	fire suppression, exotic plants
Rockdale	Miami-Dade County	11-100	fire suppression, exotic plants
Ron Ehman Park	Miami-Dade County	11-100	fire suppression, exotic plants
Seminole Wayside Park	Miami-Dade County	11-100	fire suppression, exotic plants
Tamiami Pinelands	Miami-Dade County	10-100	fire suppression, exotic plants
Turnpike Extension and 93rd Terrace***	Private	1	development, fire suppression, exotic plants
West Biscayne Pineland	Miami-Dade County	10-100	fire suppression, exotic plants
Quail Roost Pineland	Miami-Dade County	11-100	not yet assessed
NFC #P-365	private	11-100	not yet assessed
NFC #P-297	private	11-100	not yet assessed
NFC #P-316	private	11-100	not yet assessed

NFC #P-132	private	2-10	not yet assessed
Porter Russell Pineland Preserve	Tropical Audubon Society	10-15	not yet assessed

Alan Herndon reported 18 occurrences in an undated report (Bradley and Gann 1999, p. 12). Six of these occurrences have been developed and several additional sites have been disturbed or, because of lack of management, the sites are now dominated by exotic plants and/or dense hardwoods (Bradley and Gann 1999, p. 12). Florida brickell-bush may no longer occur at some of these sites (Bradley and Gann 1999, p. 13). IRC mapped all of the public and many private pinelands in Miami-Dade County outside of Everglades National Park in 2004. With the exception of Porter Russell Preserve, they found no new sites for this plant. Data from IRC from 2007 indicated that 21 other locations have an undetermined status (i.e., the area was surveyed, but the plant was not observed by IRC) (K. Bradley, pers. comm. 2007). Additional survey work at these locations (all private land) will be needed to determine presence. The species was not found during a two-year project intended to survey and map exotic and rare plants along Florida Department of Transportation (FDOT) right-of-ways within Miami-Dade County (Gordon et al. 2007, p. 1, 36).

Population Estimates/Status: See Table 1. Larry and Penny Thompson Park has the only large population. Based upon data from IRC, Keith Bradley (pers. comm. 2007) had estimated 1,001-10,000 individuals at this location. More recently, based upon data from Fairchild Tropical Botanical Garden (FTBG), Jennifer Possley (pers. comm. 2008) had estimated the population size at 1,000 – 1,500 individuals, noting that 200 plants were found in a survey covering approximately 10 percent of the Park. Bradley and Gann (1999, p. 12) indicated that this species rarely occurs in great abundance; most populations are very sparse, containing a low density of plants.

Bradley and Gann (1999, p. 12) estimated population size using a logarithmic scale. On that scale, the total population of Florida brickell-bush was estimated at 1,001-10,000 plants, with the exact number probably between 5,000 and 7,000 plants (Bradley and Gann 1999, p. 12). They also stated that the population was probably declining because “private sites where this plant occurs are either not being managed or are being developed. Populations on public lands are also being impacted.”

During 2004, NFCs (pinelands and hardwoods) of Miami-Dade County were mapped, including public and private lands where the county government obtained landowner permission or determined it was not necessary. This mapping did not disclose any new occurrences. In addition to the mapping of NFCs, selected occurrences of plants have been mapped at public sites. The mapping provided a more detailed assessment of the species’ status.

The rounded global status of Florida brickell-bush is considered to be T1, critically imperiled (NatureServe 2009, p. 1). NatureServe (2009, p. 1) indicates that this taxon is a highly restricted endemic with a very narrow range. In 2009, FNAI changed the global status of this species from G1 “critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-

made factor” to G5, “demonstrably secure globally” (FNAI 2009a 2009b, 2010). Florida brickell-bush is listed as endangered by the State.

#### THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Residential and commercial development and agriculture have drastically reduced the habitat for Florida brickell-bush throughout pine rockland habitats in south Florida. Pine rockland habitat in Miami-Dade County has been reduced to about 11 percent of its natural extent (Kernan and Bradley 1996, p. 2). Of the original 182,780 acres (74,000 ha), 20,106 acres (8,140 ha) of pine rockland habitat remained in 1996. Much of the remaining pineland is in Everglades National Park, but the range of Florida brickell-bush does not extend into the Park. Outside of Everglades National Park, only about one percent of the Miami Rock Ridge pinelands have escaped clearing, and much of what is left is in small remnant blocks isolated from other natural areas (Herndon 1998, p. 1).

Habitat loss continues to occur in the species’ range, and most remaining suitable habitat has been negatively altered by human activity. Miami-Dade County has developed a network of small public conservation lands and has encouraged conservation of natural vegetation on private land. The County’s actions may have averted extinction of this species. As a result, some opportunities exist to conserve this plant on private land, but there is little opportunity to acquire more conservation lands. Conservation of privately-owned pine rocklands in Miami-Dade County is largely a matter of county government cooperation with private landowners and the county offers incentives for landowners to maintain their NFCs.

Private properties are very important to the existence of Florida brickell-bush-(Bradley and Gann 1999, p. 13). Bradley and Gann (1999, p. 13) emphasized that these areas need to be acquired or managed. Based upon available data, 8 of the remaining 19 occurrences are on private lands. Given the small number of plants at most sites and the species’ restricted range, it is not clear that existing occurrences are large enough to persist. Persistence of Florida brickell-bush will likely be largely dependent upon conservation of private lands and the implementation and success of management measures on conservation lands, including prescribed fire and exotic plant control.

Climatic changes and sea level rise are major threats to south Florida, including this species and its habitat. The Intergovernmental Panel on Climate Change (IPCC) reported that the warming of the world’s climate system is unequivocal based on documented increases in global average air and ocean temperatures, unprecedented melting of snow and ice, and rising average sea level (IPCC 2007, p. 2; 2008, p. 15). Sea-level rise is the largest climate-driven challenge to low-lying coastal areas and refuges in the sub-tropical ecoregion of southern Florida (U.S. Climate Change Science Program [CCSP] 2008, p. 5-31, 5-32). The long-term record at Key West shows that sea level rose on average 0.088 inches (0.224 cm) annually between 1913 and 2006 (National Oceanographic and Atmospheric Administration [NOAA] 2008, p. 1). This equates to approximately 8.76 inches (22.3 cm) over the last 100 years (NOAA 2008, p. 1).

IPCC (2008, p. 28) emphasized it is very likely that the average rate of sea-level rise during the 21<sup>st</sup> century will exceed that from 1961 to 2003 (i.e., 0.071 inches [0.18 cm] per year), although it was projected to have substantial geographical variability. Partial loss of the Greenland and/or Antarctic ice sheets could result in many feet (several meters) of sea-level rise, major changes in coastlines, and inundation of low-lying areas (IPCC 2008, p. 28-29). Low lying islands and river deltas will incur the largest impacts (IPCC 2008, p. 28-29). Because dynamic ice flow processes in ice sheets are poorly understood, timeframes are not known; however, modeling indicates that “more rapid sea-level rise on century timescales cannot be excluded” (IPCC 2008, p. 29). According to CCSP (2008, p. 5-31), much of low-lying, coastal south Florida “will be underwater or inundated with salt water in the coming century”.

IPCC (2008, p. 3, 103) concluded that “climate change is likely to increase the occurrence of saltwater intrusion into coastal aquifers as sea level rises” and that “sea-level rise is projected to extend areas of salinisation of groundwater and estuaries, resulting in a decrease of freshwater availability for humans and ecosystems in coastal areas.” From the 1930s to 1950s, increased salinity of coastal waters contributed to the decline of cabbage palm forests in southwest Florida (Williams et al. 1999, p. 2056-2059), expansion of mangroves into adjacent marshes in the Everglades (Ross et al. 2000, p. 9, 12-13), and loss of pine rockland in the Keys (Ross et al. 1994, p. 144, 151-155). Hydrology has a strong influence on plant distribution in these and other coastal areas (IPCC 2008, p. 57). Such communities typically grade from salt to brackish to freshwater species. Human developments will also likely be significant factors influencing whether natural communities can move and persist (IPCC 2008, p. 57; CCSP 2008, p. 7-6).

The Science and Technology Committee of the Miami-Dade County Climate Change Task Force (MDCCCTF) (2008, p. 1) recognizes that significant sea level rise is a very real threat to the near future for Miami-Dade County. In a January 2008 statement, the MDCCCTF (2008, p. 2-3) warned that sea-level is expected to rise at least 3-5 feet (0.9-1.5 meters) within this century. With a 3-4 foot (0.9-1.2 m) rise in sea level (above baseline) in Miami-Dade County: “Spring high tides would be at about + 6 to 7 feet; freshwater resources would be gone; the Everglades would be inundated on the west side of Miami-Dade County; the barrier islands would be largely inundated; storm surges would be devastating; landfill sites would be exposed to erosion contaminating marine and coastal environments. Freshwater and coastal mangrove wetlands will not keep up with or offset sea level rises of two feet per century or greater. With a five foot rise (spring tides at nearly +8 feet), Miami-Dade County will be extremely diminished.”(MDCCCTF 2008, p. 2-3).

In summary, all known occurrences are at some risk to habitat loss and modification. Extant occurrences on private land are threatened by development. Some occurrences are in low-lying areas and will be affected by rising sea level. Overall threat level of habitat loss from development is high, since nearly half the known occurrences are in private ownership. Overall threat level of habitat loss from sea-level rise is currently low, but expected to

become severe in the future.

- B. Overutilization for commercial, recreational, scientific, or educational purposes. None known.
- C. Disease or predation. None known.
- D. The inadequacy of existing regulatory mechanisms. FDACS designated *Brickellia mosieri* as endangered under Chapter 5B-40, Florida Administrative Code. This listing provides little or no habitat protection beyond the State's Development of Regional Impact process, which discloses impacts from projects, but provides no regulatory protection for State listed plants on private lands. Without local or county ordinances preventing the destruction of the plant, conservation does not occur.

Miami-Dade County enacted the Environmentally Endangered Lands Covenant Program in 1979 (Service 1999, p. 3-177). The Miami-Dade Forest Resources Program has regulatory authority over pine rocklands and tropical hardwood hammocks and is charged with enforcing regulations that provide partial protection on the Miami Rock Ridge (Service 1999, p. 3-177). This includes authority over all NFCs in the County, including County- and city-owned parcels (Service 1999, p. 3-177). Despite these conservation mechanisms, the species and habitat is still at risk.

- E. Other natural or manmade factors affecting its continued existence. Exotic plant taxa have significantly affected pine rocklands. As a result of human activities, at least 277 taxa of exotic plants have invaded pine rocklands throughout south Florida (Service 1999, p. 3-175). Burma reed (*Neyraudia neyraudiana*) and Brazilian pepper (*Schinus terebinthifolius*) are especially problematic for Florida brickell-bush (Bradley and Gann 1999, p. 13). Bradley and Gann (1999, p. 13) indicated that the control of exotic plants is a very important part of habitat maintenance. Exotic plants threaten all extant occurrences (Table 1) (Bradley and Gann 1999, p. 15; K. Bradley, pers. comm. 2007).

In a recent study to better understand the location and extent of invasive exotic plants and rare native plants along roadways in Miami-Dade and Monroe Counties, 88 (of 121) - total targeted exotic plant species were found in at least one road segment (Gordon et al. 2007, p. 10). Of the road segments surveyed (16,412), 38 percent (6,264) contained at least one exotic plant; some segments contained more than one species of invasive exotic plant (and as many as 15) (Gordon et al. 2007, p. 10-11). In Miami-Dade County, the most frequent naturalized invasive exotic plants recorded were Brazilian-pepper, punctureweed (*Tribulus cistoides*), and napier grass (*Pennisetum purpureum*) (Gordon et al. 2007, p. 11).

Fire is required to maintain the pine rockland community. Under natural conditions, lightning fires typically occurred at 3- to 7-year intervals. With fire suppression, hardwoods eventually invade pine rocklands and shade out understory species like Florida brickell-bush. Fire suppression has reduced the size of the areas that burn and habitat fragmentation has

prevented fire from moving across the landscape in a natural way. Thus, many pine rocklands are gradually becoming tropical hardwood hammocks. Natural fires are unlikely to occur or will likely be suppressed in the remaining, highly fragmented pine rockland habitat. The use of frequent prescribed fire to create a mosaic of open habitats is recommended for this species (Bradley and Gann 1999, p. 11-12, Chafin 2000, p. NA). Fire suppression threatens Florida brickell-bush at nearly all occurrences (Table 1) (Bradley and Gann 1999, p. 15; K. Bradley, pers. comm. 2007).

Exotic species have altered the type of fire that occurs in pine rocklands. Historically, pine rocklands had an open, low understory where natural fires remained patchy with low temperature intensity, thus sparing many native plants such as Florida brickell-bush. Dense infestations of Burma reed and Brazilian pepper cause higher fire temperatures and longer burning periods, such that vegetation maintenance through fire alone may not be possible.

After a period of fire suppression in pine rocklands, it also becomes necessary to control invading native hardwoods mechanically. As with exotics, excess growth of native hardwoods would result in a hot fire which can be destructive. Mechanical treatments cannot entirely replace fire because pine trees, understory shrubs, grasses, and herbs all contribute to an ever-increasing duff layer. When this layer becomes thick, it covers the herbs and prevents most seeds from germinating. Duff will continue to accumulate even if hardwoods are removed mechanically. In addition, the ashes left by fires provide important post-fire nutrient cycling, which is lost with mechanical removal.

Management of pine rocklands in Miami-Dade County is further complicated because all of the remnants are small, fragmented areas bordered by urban development. Areas near managed pine rockland that contain exotic species can act as a seed source of exotics allowing them to continue to invade the surrounding pine rockland (Bradley and Gann 1999, p. 13).

Based on the small numbers of individuals within the species' narrow range, catastrophic events such as hurricanes or tropical storms may negatively impact the species by altering the vegetation composition or water levels or by creating masses of urban debris that may be disposed of in remnant pinelands, which was a problem after Hurricane Andrew in 1992. According to the National Oceanographic and Atmospheric Administration, Miami-Dade County, the Keys, and western Cuba are the most storm-prone areas in the Caribbean so this threat is expected to continue.

Only small and fragmented occurrences of this plant remain. As a result, threats associated with small population size ensue. These include potential vulnerabilities from environmental (catastrophic hurricanes), demographic (potential episodes of poor reproduction), and genetic (potential inbreeding depression) threats. Viable plant populations for small, short-lived herbs may consist of tens of thousands of plants. Although no population viability analysis has been conducted for this plant, indications are that most existing populations are at best marginal; it appears that only one is sizeable and perhaps viable.

In summary, Florida brickell-bush is vulnerable to a wide array of natural and human factors, including: exotic plants, fire suppression, altered fire type, hurricanes and extreme weather events, storm surges, small and isolated occurrences, and restricted range.

#### CONSERVATION MEASURES PLANNED OR IMPLEMENTED

In 1979, Miami-Dade County enacted the Environmentally Endangered Lands Covenant Program, which reduces taxes for private landowners of pine rocklands and tropical hardwood hammocks who agree to not develop their property and manage it for a period of ten years (Service 1999, p. 3-177). Miami-Dade County also purchases NFCs, including tropical hammocks and pine rocklands. Miami-Dade County embarked on a large-scale program, with some State funding, to acquire and manage environmentally endangered lands, including the Rockdale Pineland where this species occurs. The Miami-Dade Forest Resources Program has regulatory authority over pine rocklands and tropical hardwood hammocks and is charged with enforcing regulations that provide partial protection on the Miami Rock Ridge (Service 1999, p. 3-177). This includes authority over all NFCs in the County, including County- and city-owned parcels (Service 1999, p. 3-177).

Public lands with Florida brickell-bush (Table 1) are managed by a variety of entities with various goals and objectives and often with limited resources. In 2005, the Service funded IRC through the Private Stewardship Grant Program to facilitate restoration and management of privately owned pine rockland habitats in Miami-Dade County. Restoration efforts include exotic plant control, light debris removal, hardwood management, and reintroduction of pines. Management plans include recommendations for prescribed burning, debris cleanup, exotic animal control, and hydrological restoration. This project has been completed.

In 2007, the Service funded IRC to implement conservation activities associated with three candidate plant species: Florida brickell-bush, Blodgett's silverbush (*Argythamnia blodgettii*), and Carter's small-flowered flax (*Linum carteri* var. *carteri*) on pine rockland fragments in Miami-Dade County in private ownership. The objective of this project is to restore suitable habitat and reintroduce and establish new populations in pine rocklands. This project was expanded in 2008 to include conservation actions on public lands. Reintroductions will attempt to establish new occurrences and increase population sizes. Working with a variety of partners, IRC is making progress with prescribed fire, plant cultivation, and reintroduction to select sites (Bradley et al. 2009, p. 1-9). In February and March 2009, IRC began cultivation of 68 cuttings using germplasm obtained from Larry and Penny Thompson Park (Bradley et al. 2009, p. 2, 4). Efforts to establish new populations are underway. As of May 2009, three of eight plants outplanted to a private landowner's property remained (Bradley et al. 2009, p. 3, 5). Success has been limited, most likely due to drought conditions (Bradley et al. 2009, p. 3). In July 2009, IRC successfully conducted its first prescribed fire at the George N. Avery Pineland (K. Bradley, pers. comm. 2009).

The Service's Coastal and Partners for Fish and Wildlife programs are also pursuing similar habitat restoration projects, which could help improve the status of the species. In 2009,

\$400,000 of stimulus funding was allocated for habitat restoration in Miami-Dade County through the Coastal program as part of the Pine Rockland Initiative (D. DeVore, Service, pers. comm. 2010). The Partners for Fish and Wildlife program is also supporting similar habitat restoration projects in Miami-Dade County.

The FDOT collaborated on and funded a study of the approximately 650 miles of FDOT roadway in Miami-Dade and Monroe counties (District 6) (Gordon et al. 2007, p. 1, 3). The study was conducted by The University of Florida, in collaboration with IRC and the FNAI to survey and map exotic and rare native plants along FDOT right-of-ways within Miami-Dade and Monroe counties and to create a database that can be updated to reflect future activities and conditions (Gordon et al. 2007, p. 1, 3).

## SUMMARY OF THREATS

Nearly all of the pine rockland habitat within the narrow range of Florida brickell-bush has been urbanized, converted to agricultural use, or degraded, so that the original low understory has been replaced by hardwoods or exotic plants. There are 19 extant occurrences of Florida brickell-bush in remnants of its former pine rockland habitat in Miami-Dade County (Table 1) (Bradley and Gann 1999, p. 15; K. Bradley, pers. comm. 2007). More than half occur on conservation land. Essentially all remaining occurrences are small and isolated. This species is threatened by habitat loss, which is exacerbated by habitat degradation due fire suppression, the difficulty of applying prescribed fire to pine rocklands, and threats from exotic plants (Bradley and Gann 1999, p. 13, NatureServe 2009, p. 1-2). Remaining habitats are fragmented. Climatic changes and sea level rise are long-term threats that will continue; these factors are expected to continue to impact pine rocklands and ultimately reduce the extent of available habitat. Florida brickell-bush is vulnerable to natural disturbances, such as hurricanes, tropical storms, and storm surges. Due to its restricted range and the small sizes of most isolated occurrences, this species is vulnerable to environmental (catastrophic hurricanes), demographic (potential episodes of poor reproduction), and genetic (potential inbreeding depression) threats. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

\_\_\_\_Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

## RECOMMENDED CONSERVATION MEASURES

- Acquire privately owned parcels that support this plant or contain suitable habitat.
- Prevent further destruction or degradation of existing pine rocklands and adjacent areas (Service 1999, p. 3-191). Acquire available fragments, promote conservation easements and landowner agreements, work with private landowners, and enforce regulatory protection of pine rocklands and adjacent areas that support this species (Service 1999, p. 3-191).
- Reestablish occurrences or introduce it to intact pine rocklands that have an open

understory maintained by prescribed fire (Bradley and Gann 1999, p. 11).

- Use prescribed fire. All pine rocklands adjacent to occurrences of this taxon should be burned periodically (Bradley and Gann 1999, p. 11-12). In areas that have been suppressed for many years, reintroduce fire in a step-wise fashion, and implement a monitoring component that captures the health of the community and species that occur in association with Florida brickell-bush (Bradley and Gann 1999, p. 13; Possley and Maschinski 2007, p. 10).
- Control exotics in pine rockland through the careful use of manual labor, mechanical treatment (where appropriate), herbicides, and prescribed fire (Bradley and Gann 1999, p. 13).
- Support exotics control program in Miami-Dade County. Management of pine rocklands that contain exotics is complicated in fragmented areas bordered by urban development (Bradley and Gann 1999, p. 13); control adjacent seed sources, use outreach, and encourage the development of strategies and partnerships to maximize effectiveness.

## LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
<b>Moderate</b> to Low	<b>Imminent</b>	Monotypic genus	7
		<b>Species</b>	<b>8*</b>
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

*Magnitude:* There are 19 extant occurrences of Florida brickell-bush within a restricted range. Only one relatively large occurrence is known; all others are small and isolated. Habitat loss and degradation due to development are threats; nearly half of the extant populations are on private land. Occurrences are in low-lying areas. Climatic changes and sea level rise are long-term threats that will reduce the extent of habitat. Nearly all remaining populations are threatened by fire suppression, difficulty in applying prescribed fire, and exotic species. However, management actions are being taken on some public and private lands. This species is

vulnerable to natural disturbances, such as hurricanes, tropical storms, and storm surges. Due to the small and fragmented nature of the occurrences, stochastic events and disease or genetic bottlenecks may strongly affect this species. Although no population viability analysis has been conducted, indications are that most existing occurrences are (at best) marginal; possibly only one is sizeable enough to be viable. A number of occurrences exist, more than half are on public lands, and some threats are being partially addressed through conservation efforts; overall, the magnitude of threats is moderate.

*Imminence:* Habitat loss and degradation due to development is a current threat at nearly half of the remaining occurrences, which are located on private (non-conservation) land. These threats are considered to be imminent. Sea level rise is currently occurring and has resulted in the loss of pine rocklands. However, this is considered a long-term threat since we do not have evidence that it is currently affecting any population. Nearly all occurrences are currently threatened by one or more of the following factors: fire suppression, difficulty in applying prescribed fire, exotic species, or incompatible management practices. However, some efforts are underway to use prescribed fire and control exotics on conservation lands. Hurricane Andrew impacted Miami-Dade County in the past and future hurricanes are expected; this threat is considered imminent. Problems associated with small and isolated populations are likely currently occurring. Most occurrences do not appear large enough to be viable, even if sites on conservation lands are well managed. Overall, threats are imminent.

Rationale for Change in Listing Priority Number (insert if appropriate):

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. This plant persists on several conservation lands. With proper management, some threats to this species can be removed or reduced.

DESCRIPTION OF MONITORING: Monitoring for this species is not being actively or regularly conducted at most sites.

The Service completed a project with IRC and Miami-Dade County to map public and many private NFCs and inventory rare and sensitive plants species for the County's geographic information system. This project provided a list of plant species for each site. The project will enable the County to manage information on pinelands and detect changes in their extent.

FTBG and Miami-Dade County are working on a fire monitoring protocol for Miami-Dade County preserves (J. Maguire, Miami-Dade County, pers. comm. 2008). The draft protocol suggests three levels of monitoring, focusing on rare species, vegetation structure, and diversity (Possley and Maschinski 2007, p. 4). Florida brickell-bush is one of several indicator species to be used in the monitoring transects. Currently, FTBG has GPS locations for three separate populations at Larry and Penny Thompson Park (J. Maschinski, pers. comm. 2007). However, no additional monitoring data are available.

## COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: The Service requested new information (observations, data, reports) regarding the status of this plant or any new information regarding threats to this species from: FDACS, National Park Service, Service (National Wildlife Refuges), Florida Department of Environmental Protection, Miami-Dade County, Florida Fish and Wildlife Commission, FNAI, IRC, Historic Bok Sanctuary, The Nature Conservancy, FTBG, Archbold Biological Station, NatureServe, Miami University, University of Central Florida, Florida International University, University of Florida, Princeton, members of the Rare Plant Task Force, botanists, and others. In total, the previous assessment was sent to approximately 200 individuals.

The State of Florida does not include plants in their State Wildlife Action plan.

Indicate which State(s) did not provide any information or comments: Florida

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  June 15, 2010  
for Regional Director, Fish and Wildlife Service Date

Concur:  Date: October 22, 2010  
ACTING  
Director, Fish and Wildlife Service

Do not concur: \_\_\_\_\_  
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: March 30, 2010

Conducted by: Paula Halupa, South Florida Ecological Services Office